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SUMMARY REPORT ON MODELING ANALYSIS OF SELECTED POWER PLANTS IN 128 AQCRs FOR EVALUATION OF IMPACT ON AMBIENT SO2 CONCENTRATIONS, VOLUME I

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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16. ABSTRACT

This report presents a summary of a series of 128 reports covering modeling analyses of 401 power plants distributed throughout 128 AQCRs in 44 states. The purpose of the study is to evaluate the impact on ambient SO_2 concentrations of power plant operations. This study provides a base for further analysis if decisions must be made regarding possible compliance extensions or fuel use options for power plants.

Volume I of this report covers the analysis of 195 power plants in 60 AQCRs by Walden Research Div. of Abcor, Inc. Volume II of this report covers the analysis of 206 power plants in 68 AQCRs by GEOMET, Inc.

This study is intended only to add to the overall analyses of the power plant industry being conducted both by governmental agencies and private industry. Decisions on final evaluations based on the material presented in this report pertaining to specific plants should consider the input data available for the model, the assumptions on which the model is based, the procedures followed in conducting the analysis, as well as several other factors not addressed herein.

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by

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June 1975

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ABSTRACT

This report presents a summary of a series of 128 reports covering modeling analyses of 401 power plants distributed throughout 128 AQCRs in 44 states. The purpose of the study is to evaluate the impact on ambient SO_2 concentrations of power plant operations. This study provides a base for further analysis if decisions must be made regarding possible compliance extensions or fuel use options for power plants.

A brief synopsis of the background for this study is presented in the introduction to this report. This is followed by a description of the analysis procedure and a presentation of the summary results.

Volume I of this report covers the analysis of 195 power plants in 60 AQCRs by Walden Research Division of Abcor, Inc. Of these 195 power plants modeled for 1972 operations, SO_2 emissions from approximately 20 resulted in concentrations which, by themselves, exceeded the primary 24-hour SO_2 standard.

Volume II of this report covers the analysis of 206 power plants in 68 AQCRs by GEOMET, Inc. Of these 206 power plants modeled for 1972 operations, SO_2 emissions from approximately 54 resulted in contributions which, by themselves, exceeded the primary 24-hour SO_2 standard.

Emissions from none of the plants for which an annual SO_2 prediction was obtained exceeded the primary annual SO_2 standard. Since for about 68 plants located in areas of high terrain, the model used estimated short-term concentrations only, no annual concentrations were predicted for those plants.

This study is intended only to add to the overall analyses of the power plant industry being conducted both by governmental agencies and by private industry. Decisions on final evaluations based on the material presented in this report pertaining to specific plants should consider the input data available for the model, the assumptions on which the model is based, the procedures followed in conducting the analysis, as well as several other factors not addressed herein.

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The EPA Project Officer for the work reported in Volume I of this study was C. E. Mears, and the Walden Project Manager was Dr. L. Morgenstern. The project was aided by the cooperation and assistance provided by D. H. Barrett, R. F. Lee, and A. G. Larson of Monitoring and Data Analysis Division, Office of Air Quality Planning and Standards, Office of Air and Waste Management, EPA. The technical staff at Walden who contributed significantly to this project are: R. Buerschaper, T. Curtin, D. Dorman, L. Fereshetian, B. Kemerer, K. Kennedy, Dr. S. Khanna, J. Sacco, M. Shah, and A. Zakak. Publication of all reports was under the direction of J. Read.

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I. INTRODUCTION

Recent developments in the energy field have necessitated review of state implementation plan requirements in the light of known or predicted shortages of oil and/or gas. In addition, the Energy Supply and Environmental Coordination Act (June, 1975) requires certain analyses pertaining to power plant fuel use and the resultant impact on air quality. As a result, short-term modifications to plan requirements may be necessary to accommodate to the types and grades of fuel available; also, longer-term modifications may involve substitution of fuel types (e.g., coal for oil) or use of fuels with a higher sulfur content at selected power plants. In all cases, the modifications made should attempt to minimize the adverse impact on air quality and should assure the maintenance of primary air quality standards.

As the principal single user of fossil fuels, power plants offer the most expeditious means for accommodating to available fuels with minimum impact upon air quality. Thus, a systematic method to evaluate the air quality impact associated with various changes in fuels used by large power plants is required. Two previous studies performed by and for EPA* have evaluated probable air quality impact for about 270 power plants throughout portions of the United States which were considered primary candidates for fuel substitutions and associated plan modifications. Appendix A should be reviewed at this point to obtain an understanding of these previous studies. The purpose of the present study is to estimate the probable impact on annual and 24-hour SO_2 concentrations for 1972 operations at the remaining large power plants in the nation. Volume I of this report outlines the analyses by Walden Research Division of Abcor, Inc., of 195 power plants in 60 AQCRs. Volume II outlines the analyses by GEOMET, Inc., covering 206 power plants in 68 AQCRs.

Although results have been reported for individual power plants, it is essential to understand the assumptions upon which the study was based and the limitations that must be adhered to when using modeling results

* See list of references.

for a particular power plant to assist in choosing a desirable course of action. Any decisions based on material presented in this report pertaining to individual plants should carefully and completely take into account the quality of input data available for the model, the assumptions on which the model is based, and the procedures followed in conducting the analysis.

The final evaluation for a given plant should consider all relevant data on the plant and should recognize the inherent limitations resulting from the data and procedures used in this modeling effort. Other factors which should be considered include: the impact of other sources in the area, projected growth in the region, measured air quality data, known or suspected downdraft or fumigation problems, unique nearby terrain features, nearby land use patterns and population distributions, more specific operational data for the plant, impact of units new since 1972, specific meteorological studies for the area, and additional studies or findings by other investigators. Only a full consideration of all these data will lead to a balanced and reasonable decision.

II. METHOD OF ANALYSIS

An overview of the method of analysis is presented by the flow diagram in Figure 1. This chart shows the relationship among the three major task elements and indicates further subtask components within each of these. Similar techniques and procedures were used both by GEOMET, Inc., and by Walden Research in their respective analyses of selected power plants.

A. SOURCE INPUT DATA

Data for the large power plants in the AQCRs studied were taken directly from the Federal Power Commission (FPC Form 67) and converted to the computer format required by the model. Base year data were obtained for 1972 operations. Adequate design and operating data for new units or new plants to be installed beyond 1972 were not generally available. However, the impact of such new units or new plants should be evaluated before any final action is taken on any specific plant.

Use of the FPC data base limits consideration to plants with a generating capacity of 25 megawatts (MW) or more which are part of a public utility system having a total capacity of 150 MW or more, since these are the only plants which have to file FPC Form 67. For certain AQCRs, the FPC requires that all power plants with a station capacity of 25 MW or more must be reported regardless of total system capacity. In general, this data base limitation is reasonable, since plants smaller than 25 MW would have rated capacities no larger than many industrial boilers.

Source data required as input to the diffusion models include SO_2 emission rate, stack height, stack gas exit velocity, and stack gas temperature. Furthermore, the change in load demand with time of year is also input to the models.

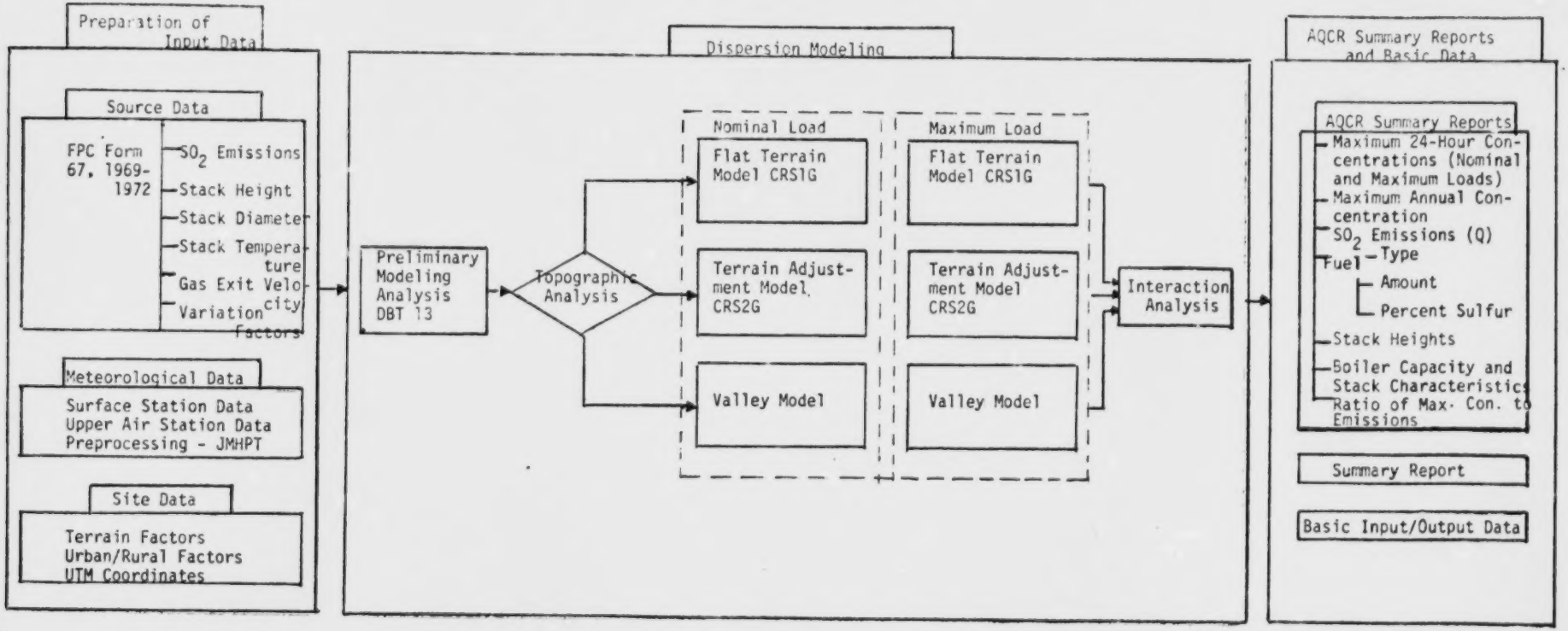

Figure 1. Power Plant Modeling Procedures

The plant variation factors (refer to Appendix C) are a measure of the relative rate of emission for the entire plant for each month. Variations in total emission rate for the plant are influenced both by changes in power demand and by changes in the type of fuel being burned. The plant monthly variation factors are applied by the single source model to the emissions from each stack during the analysis for the days of each respective month. For plants analyzed with the valley model, the highest monthly variation factor during the year was used to obtain the modeled value.*

Several power plant units indicated the use of natural gas as a secondary fuel. However, where combustion of this natural gas in the quantities reported constituted negligible contributions to SO_2 emissions, it was not included in the analysis.

In the Walden analysis, in general, emissions from secondary fuels were included in the overall emission rate if they contributed more than 1% of the total emissions from that unit. The monthly variations of these fuels were incorporated into the total plant variation if the emissions were greater than 10% of the total. In the GEOMET analysis, emissions from secondary fuels were included when these fuels amounted to 5% or more of total heat input during at least one month of the year. In both cases, monthly variations were determined on the basis of monthly emissions from each fuel calculated from fuel use and annual average sulfur content.

B. METEOROLOGICAL DATA

For an individual plant analysis, the meteorological data assembled consist of (1) hourly surface weather observations in standard card image format and (2) twice daily mixing height tabulations. The year 1964 was selected for the analysis because it is the only one which satisfies the dual requirement of hourly surface data and wind direction azimuth recorded to the nearest 10-degree sector.

* A discussion of the diffusion models applied to different plants begins on page 6.

The surface and upper air data are preprocessed by a computer program. Among the different functions performed by this routine are:

- Screening of all data for completeness
- Determination of hourly stability classification
- Interpolation of twice daily mixing height data to hourly values

The output of this preprocessing operation yields a set of meteorological data for input to the modeling analysis.

For plants analyzed with the VALLEY model, no measured meteorological data were used in the calculations. The calculations for these plants were made for the least favorable conditions likely to occur, which include a stable atmosphere and a wind speed of 2.5 m/sec (see Appendix B).

C. SITE DATA

A principal site factor which can influence the impact on ground-level concentrations from power plant operations is the topography of the surrounding terrain. Isolated elevated terrain features such as nearby hills or bluffs can be severely impacted by plume transport along selected azimuth directions. In other locations, the power plant may be located in a valley with elevated terrain surrounding the plant site. Under certain conditions, lateral plume dispersion may be restricted by the valley walls.

The location of the power plant relative to urban areas also can influence the impact of plant operations on ambient concentration levels. Consequently, specification of the urban/rural characterization of the plant site location is an input parameter to the modeling analysis.

D. DISPERSION MODELING

For plants located in relatively flat terrain, a single source model was used to estimate both annual and 24-hour maximum SO_2 concentrations

from each power plant, based on 1972 operations. This model was developed by the Meteorology Laboratory (NERC, RTP) of EPA. It employs a Gaussian plume formulation and Briggs's plume rise equation* and uses hourly observations of meteorological conditions. Meteorological data were obtained from National Climatic Center records for the station judged most representative of conditions at each individual plant. A further description of the model is included in Appendix B. As applied herein, the model basically estimates 1-hour average SO_2 concentrations at a preselected field of receptors for each hour of the year from each power plant. The annual average concentration and the 24-hour average concentration (for each day) for each receptor are then calculated. Where interactions between power plants were significant, supplementary calculations were made to account for the impact of two or more facilities.

Where the topography showed surrounding terrain at significantly higher elevations than those of the plants, the modeling analysis considered this topographic factor by the application of a terrain adjustment procedure described in Appendix B.

In some cases, the topography at certain plant sites was above the calculated plume height for at least one stack at the plant. The analysis procedure considered this factor by the application of a special model designed to estimate maximum ground-level concentrations for elevated receptor sites in valley locations (EPA "valley model"). The general features of this model are also described in Appendix B. The scope of the analysis conducted with this special model was designed only to determine representative maximum 24-hour concentration levels. Because plume dispersion from power plants located in valley sites constitutes a complex interaction of source factors, terrain factors, and meteorological factors, a more detailed and exhaustive analysis of the specific power plant site is desirable prior to formulating any action on such a plant.

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* See list of references.

Since only power plant operations were being modeled, and no other sources were considered, it was not possible to calibrate the model using measured air quality data. The calculated concentrations are considered to be reasonable estimates of ambient concentrations for the conditions simulated.

Modeling of power plant operations was conducted to determine air quality impact for 1972 operations. In many cases, the impact on air quality after a proposed conversion of a power plant (or part of a plant) to other fuels will be desired. The relationship between emissions and ambient air concentrations is dependent on source factors, meteorological factors, and local terrain effects. A change in plant operating conditions and emissions does not necessarily imply a directly proportional change in ambient concentrations. Therefore, additional detailed analysis must be undertaken if an estimate of the impact of the plant at different operating conditions is desired.

E. MAXIMUM LOAD VERSUS NOMINAL LOAD OPERATIONS

Emission data input to the single source model is based on average monthly operations for each month of the year. Of course, the level of power plant operations varies from day to day; however, the FPC data are only available on a monthly basis. A power plant could quite possibly operate at near maximum rated capacity for 24 hours in many areas of the country. If such operations were coincident with the days of highest predicted concentrations, the model's maximum predictions could be significantly low.

Therefore, modeling results are presented in this report for two situations, as follows:

Nominal Load Case - This presents maximum concentrations calculated by the model based on average monthly emission rates.

Maximum Load Case - This case was calculated assuming the plant to be operating at 95 percent of rated capacity during selected

days of highest concentration found by using the monthly average emission rates. Since the maximum load case involves a greater plume rise, a somewhat higher concentration may actually occur on a different day. To allow for this contingency, a ten percent safety factor was added to the computed concentration.

For the same meteorological conditions, ground-level concentrations arising from nominal and maximum operating loads can be expected to differ, due to the joint effect of changes in emission rates, with corresponding changes in stack gas exit velocity and temperature. In addition, "worst case meteorological conditions" often vary with plant operating conditions. The specific interaction of these factors can produce higher concentrations under either nominal or maximum load conditions. Modeling of both cases provides a reasonable estimate of the range of possible values and permits identification of the maximum concentration case.

III. DISCUSSION OF RESULTS

This is the culmination of a series of three power plant modeling studies performed by and for EPA. As a result of the current and two previous studies, modeling analyses have been carried out for every power plant which reported to the Federal Power Commission in 1972. The specific number of power plants which have been modeled for each AQCR in the nation and the report which identifies them are listed in Table 1. Of the total of 670 plants, this volume deals with results obtained for 195 plants in 60 AQCRs which were modeled by Walden Research Division of Abcor, Inc. Another 206 plants modeled in the current study by GEOMET, Incorporated, are treated in Volume II. The remaining 269 plants were modeled in two previous studies, as shown in Table 1.

AQCRs listed in Table 1 under the column labelled "51 AQCR Report" were modeled in initial studies by EPA and Walden Research to determine the impact of compliance extensions at 206 power plants in 51 AQCRs. The 63 power plants in 17 AQCRs which are listed under the column labelled "63 Coal Conversion Plant Report" were subsequently examined for possible fuel conversion from oil to coal. Only plants identified at that time as candidates for coal conversion and neighboring interacting plants were considered in that study. Brief descriptions of these previous studies are given in Appendix A. Plants in AQCRs examined in the current study are listed under the column labelled "128 AQCR Study, Volume (I or II)."

When combined, the results of the three studies provide an overview of the impact of power plant operations on air quality. The results obtained for the power plants in each AQCR have been presented in separate reports, one for each AQCR. An individual AQCR report may be ordered from the Air Pollution Technical Information Center by specifying the exact title, AQCR name and number, and APTIC number associated with the report (see References). The format of these reports and a discussion of their content and interpretation is presented later in this section.

Table 2 lists the total number of plants modeled in each volume of

the current study and indicates how many of these plants, by themselves, were found to exceed the 24-hour standard for SO_2 under either nominal or maximum load conditions. These findings were based on an analysis of 1972 operations and do not account for pollutant concentrations from any source other than the individual power plant in question. It should be noted that these numbers do not include results previously obtained for many large coal- and oil-fired plants. The 20 plants modeled by Walden which, by themselves, exceeded the standard represented 10 percent of the total plants analyzed in the Walden phase of the study. For the total current study, some 18 percent of the 401 power plants produced concentrations which alone exceeded the 24-hour SO_2 standard. It should be emphasized that if the contribution from all other sources were considered, both the number and the percentage of plants exceeding the standard would increase considerably.

The fuel used during 1972 by each power plant modeled in the Walden analysis is summarized by state in Tables 3a-3v. One table for each state identifies the AQCRs; the plant names; the counties and power companies to which they belong; their 1972 megawatt capacities; the amounts of coal, oil, and gas consumed during nominal 1972 operations; the sulfur content of each fuel; and the model used in examining each plant.

The fuel listed for some plants is flagged as an estimate. For these plants, the actual fuel use was adjusted to represent an amount consistent with more normal operations than occurred during 1972. There are several reasons for including such an estimate. If the plant was down for abnormal maintenance, the fuel which would have been consumed during the down period was estimated and added to the 1972 fuel consumption reported to the Federal Power Commission (FPC Form 67). If boilers which operated part of the year were retired from further use, an appropriate adjustment was made to the actual fuel consumption to reflect a normal mode of operation without the retired boilers. Also, if the fuel consumption reflected the operations of one or more new boilers for part of the year, an adjustment

was made to include the fuel which would be consumed if the boilers were operated for the full year. In a few cases, the estimated fuel was based on 1973 fuel consumption, if this information was available when the plant was analyzed and if 1973 were judged to be more representative of normal plant operations than 1972.

The separate AQCR reports present more specific information on the operations and estimates of the air quality impact of each power plant. In addition to the information presented here in Tables 3a through 3v, the AQCR reports provide: estimates of the highest 24-hour and annual SO_2 concentrations resulting from operations at each plant, the fuel use and SO_2 emission rates associated with these highest concentrations, and the ratio of concentration to emission rate for the plant as a whole (the χ/Q ratio). Specific information on stack parameters used in the modeling analysis is also included in an appendix to each report. All the AQCR reports for the current study are in the same format and include this information in the table formats shown in Appendix C of this report.

The maximum ground-level SO_2 concentrations presented for each plant in the AQCR reports show estimates of which plants, considering only the plant's emissions, exceed or approach the National Ambient Air Quality Standards. It should be emphasized that these results include only consideration of power plant emissions. A complete analysis would also have to give consideration to emissions from other sources. However, where two or three power plants in rural areas are close enough to produce interacting effects, estimates were made of the maximum SO_2 concentrations due to the overlapping of the plumes.

New fossil-fueled power plants and expansions of existing plants planned for operations prior to the end of 1977 are described in each AQCR report. A brief discussion is included of the expanded plant output capacity, the type of fuels to be burned (if known), and a qualitative estimate of the impact of the expanded plant on air quality. These discussions serve to identify areas where the reported air quality estimates

are likely to be affected by new operations. Additional modeling analyses should be required in these areas before making decisions about the impact of changes in current power plant operations on air quality levels.

The AQCR reports also identify plants which are located in urban environments. The air quality estimates for these plants may be subject to significant additional contributions from the many sources of SO_2 in an urban area, including other power plants and other major sources of SO_2. To evaluate the interaction of concentrations from more than three plants and from the many sources of SO_2 in a densely populated urban area would involve more complex procedures and greater resources than were available for this study. Therefore, an interaction analysis was not performed for these plants. Before any course of action for these plants is chosen, a more detailed and exhaustive analysis of all sources in the vicinity should be performed.

The basis for the maximum concentration day is reported for each plant in each AQCR studied in terms of the principal fuels used, the sulfur content of each, the amount of each fuel consumed, and the amount of SO_2 emitted. These are reported both for the nominal load case and the maximum load case. A comparison of these data will indicate how near the nominal load case is to the maximum load case in terms of types and amounts of fuel consumed. Where more than one fuel is consumed at a plant, the maximum load case is based on the assumption that each boiler is burning the fuel which results in the highest SO_2 emission rate of any fuel burned in significant quantity in that boiler during 1972.

The ratios of concentrations to emissions (χ/Q) are reported for each plant in each AQCR report for the maximum concentration day (under nominal and maximum load conditions) and for the maximum annual concentration under nominal load conditions. The ratios for annual concentrations

are much lower than for 24-hour concentrations primarily because the SO_2 is dispersed over a wider area as a result of day-to-day variations in wind direction and other meteorological parameters. Variations in these ratios from plant to plant are influenced primarily by differences in surrounding terrain and stack characteristics. Elevated terrain and low stacks both generally result in higher concentrations from a plant and therefore increase the χ/Q ratio. It should be noted that the χ/Q ratios generally cannot be used to estimate the impact of changes in plant operating conditions. This is because the relationship between emissions and ambient air concentrations is dependent on source factors, meteorological factors, and local terrain effects. A change in plant operating conditions and emissions does not necessarily imply a directly proportional change in ambient concentrations. Detailed additional analysis must be undertaken to estimate the impact of different operating conditions, whether that involves a change in the fuel type in part or all of the plant, increased or decreased plant capacity, altered operating levels, new stacks, new stack-to-boiler combinations, or other significant changes.

IV. APPROPRIATE USES OF DISPERSION MODEL RESULTS

Under contract to EPA, Walden Research and GEOMET, Inc., have completed a series of dispersion model studies of power plants. These include virtually all the nation's major fossil-fuel power plants which reported to the Federal Power Commission in 1972. Limitations of these studies have been discussed in some detail elsewhere in this report and in the individual AQCR reports. It must be emphasized that results of these studies should not be taken in isolation as providing a definitive "answer" regarding the air quality impact of particular plants. This caution is necessary due to the nature of various assumptions and judgmental factors inherent in a broad study which does not evaluate individual plants in great detail.

However, even with these limitations, the dispersion model studies are of value for use in generalized analyses which assess the overall effect of some plan of action of the power plant industry. The dispersion model studies have already been used in this way for analyses related to national policy proposals affecting a large number of power plants. These analyses have been used effectively in a number of energy-environmental policy deliberations; among them are: the Clean Fuels Policy, SO_x scrubber hearings, proposed oil-to-coal conversions, actions required under the Energy Supply and Environmental Coordination Act, tall stack policy, supplementary control system evaluation, the Ohio SO_x hearing, and testimony on options for SO_2 control before congressional committees.

TABLE 1

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1] 51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
003	East Alabama (Alabama)				1
004	Metropolitan Birmingham (Ala.)	3			
005	Mobile-Pensacola-Panama City-Southern Mississippi (Alabama-Florida-Mississippi)	12			
007	Tennessee River Valley-Cumberland Mountains (Ala., Tenn.)	2			
012	Arizona-New Mexico Southern Border (Arizona, New Mexico)				1
013	Clark-Mohave (Arizona, Nevada)				5
014	Four Corners (Arizona, Colorado, New Mexico, Utah)				2
015	Phoenix-Tucson (Arizona)				8
016	Central Arkansas (Arkansas)				2
018	Metropolitan Memphis (Arkansas, Mississippi, Tennessee)				1
019	Monroe-El Dorado (Arkansas, Louisiana)				3
020	Northeast Arkansas (Arkansas)				3
021	Northwest Arkansas (Arkansas)				1
022	Shreveport-Texarkana-Tyler (Arkansas, Louisiana, Oklahoma, Texas)				9
024	Metropolitan Los Angeles (California)			16	

1. The number of plants in each AQCR examined in the respective effort is noted.
2. For AQCRs not listed, no analysis has been performed because no power plants in the AQCR reported to FPC in 1972. In addition, plants outside the contiguous 48 states have not been modeled.
3. "Summary Report on Modeling Analysis of Power Plants for Compliance Extensions in 51 Air Quality Control Regions," Walden Research (Contract 68-02-0049), December 17, 1973, EPA Report Number EPA-450/3-75-060.
4. "Summary Report on Modeling Analysis of Power Plants for Fuel Conversion," Walden Research (Contract 68-02-1377), May 1975, EPA Report Number EPA-450/3-75-064.
5. Summarized in this volume.
6. "Summary Report on Modeling Analysis of Selected Power Plants in 128 AQCRs for Evaluation of Impact on Ambient SO_2 Concentrations, Volume II," GEOMET, Inc. (Contract No. 68-02-1483), June 1975, EPA Report Number EPA-450/3-75-063.

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
025	North Central Coast (California)			1	
026	Northeast Plateau (California)			1	
029	San Diego (California)			4	
030	San Francisco Bay Area (California)			7	
031	San Joaquin Valley (California)			1	
032	South Central Coast (California)			1	
033	Southeast Desert (California)			2	
035	Grand Mesa (Colorado)				2
036	Metropolitan Denver (Colorado)				4
038	San Isabel (Colorado)				4
040	Yampa (Colorado)				1
041	Eastern Connecticut (Conn.)		1		
042	Hartford-New Haven-Springfield (Connecticut, Massachusetts)		8		
043	New Jersey-New York-Connecticut (N.J., N.Y., Conn.)		16	14	
045	Metropolitan Philadelphia (Pennsylvania, New Jersey, Delaware)		13		
046	Southern Delaware (Delaware)			2	
047	National Capital (Washington, D.C., Virginia, Maryland)		6		
048	Central Florida (Florida)			5	
049	Jacksonville-Brunswick (Florida, Georgia)	9			
050	Southeast Florida (Florida)			7	
051	Southwest Florida (Florida)			2	
052	West Central Florida (Florida)		1	8	
053	Augusta-Aiken (Ga., S. Carolina)	1			
054	Central Georgia (Georgia)	2			
055	Chattanooga (Georgia, Tennessee)	2			
056	Metropolitan Atlanta (Georgia)	3			
058	Savannah-Beaufort (Georgia, South Carolina)	4			
059	Southwest Georgia (Georgia)	1			
065	Burlington-Keokuk (Illinois, Iowa)	5		1	
066	East Central Illinois (Illinois)	2			

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
067	Metropolitan Chicago (Illinois, Indiana)				11
068	Metropolitan Dubuque (Illinois, Iowa, Wisconsin)				3
069	Metropolitan Quad Cities (Illinois, Iowa)				3
070	Metropolitan St. Louis (Illinois, Missouri)				9
071	North Central Illinois (Ill.)	2			
072	Paducah-Cairo (Illinois, Kentucky)	4			
073	Rockford-Janesville-Beloit (Illinois, Wisconsin)				3
074	Southeast Illinois (Illinois)	2			
075	West Central Illinois (Illinois)	6			
077	Evansville-Owensboro-Henderson (Indiana, Kentucky)	7		2	
078	Louisville (Indiana, Kentucky)	4			
079	Metropolitan Cincinnati (Ohio, Indiana, Kentucky)	5		1	
080	Metropolitan Indianapolis (Ind.)	4			
082	South Bend-Elkhart-Benton Harbor (Indiana, Michigan)	2			
083	Southern Indiana (Indiana)	1			
084	Wabash Valley (Indiana)	5			
085	Metropolitan Omaha-Council Bluffs (Iowa, Nebraska)				4
086	Metropolitan Sioux City (Iowa, Nebraska, South Dakota)				2
087	Metropolitan Sioux Falls (Iowa, South Dakota)				2
088	Northeast Iowa (Iowa)				5

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
092	South Central Iowa (Iowa)				4
094	Metropolitan Kansas City (Kansas, Missouri)				12
095	Northeast Kansas (Kansas)				2
096	North Central Kansas (Kansas)				1
097	Northwest Kansas (Kansas)				1
098	Southeast Kansas (Kansas)				2
099	South Central Kansas (Kansas)				4
100	Southwest Kansas (Kansas)				2
101	Appalachian (Kentucky)				1
102	Bluegrass (Kentucky)	3			
103	Huntington-Ashland-Portsmouth-Irontown (Ken. Ohio, W. Va.)	5			
105	South Central Kentucky (Ken.)				1
106	Southern Louisiana-Southeast Texas (Louisiana, Texas)				19
107	Androscoggin Valley (Maine, N.H.)		1		
109	Down East (Maine)			1	
110	Metropolitan Portland (Maine)			1	
113	Cumberland-Keyser (Maryland, West Virginia)	2			
114	Eastern Shore (Maryland)		1		
115	Metropolitan Baltimore (Maryland)			5	
116	Southern Maryland (Maryland)		1		
119	Metropolitan Boston (Massachusetts)		1	5	
120	Metropolitan Providence (Massachusetts, Rhode Island)		5	3	
121	Merrimack Valley-Southern New Hampshire (Mass., N. Hampshire)		1	1	
122	Central Michigan (Michigan)	5			
123	Metropolitan Detroit-Port Huron (Michigan)				9

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
124	Metropolitan Toledo (Michigan, Ohio)	4			
125	South Central Michigan (Mich.)	5		1	
126	Upper Michigan (Michigan)				1
127	Central Michigan (Michigan)				1
128	Southeast Minnesota-La Crosse (Minnesota, Wisconsin)	6			
129	Duluth-Superior (Minnesota, Wisc.)	3			
131	Minneapolis-Saint Paul (Minn.)	4		1	
132	Northwest Minnesota (Minnesota)				1
133	Southwest Minnesota (Minnesota)				1
134	Mississippi Delta (Mississippi)				1
136	Northern Piedmont (N. Carolina)			1	
137	Northern Missouri (Missouri)				1
138	Southeast Missouri (Missouri)				1
139	Southwest Missouri (Missouri)				3
140	Billings (Montana)				2
143	Miles City (Montana)				1
145	Lincoln-Beatrice-Fairbury (Nebraska)				2
146	Nebraska (Nebraska)				2
148	Northwest Nevada (Nevada)				2
150	New Jersey (New Jersey)		2		
151	Northeast Pennsylvania-Upper Delaware Valley (New Jersey, Penna.)	6		1	
152	Albuquerque-Mid Rio Grande (New Mexico)				3
153	El Paso-Las Cruces-Alamogordo (New Mexico, Texas)				2
155	Pecos-Permian Basin (New Mexico)				3

TABLE 1(continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
158	Central New York (New York)			1	
159	Champlain Valley (New York, Vermont)			1	
160	Genesee-Finger Lakes (N.Y.)			3	
161	Hudson Valley (New York)		2		
162	Niagara Frontier (New York)			1	
163	Southern Tier East (New York)			2	
164	Southern Tier West (New York)			3	
165	Eastern Mountain (N. Carolina)			2	
166	Eastern Piedmont (N. Carolina)			2	
167	Metropolitan Charlotte (North Carolina, South Carolina)	3			
169	Sandhills (North Carolina)			1	
170	Southern Coastal Plain (N.C.)		1	1	
171	Western Mountain (North Carolina)			1	
172	North Dakota (North Dakota)				4
173	Dayton (Ohio)	4			
174	Greater Metropolitan Cleveland (Ohio)	7			
175	Mansfield-Marion (Ohio)			1	
176	Metropolitan Columbus (Ohio)	1		1	
177	Northwest Ohio (Ohio)	1			
178	Northwest Pennsylvania-Youngstown (Ohio, Pennsylvania)	6			
179	Parkersburg-Marietta (Ohio, West Virginia)	3			
180	Sandusky (Ohio)			1	
181	Steubenville-Weirton-Wheeling (Ohio, West Virginia)	7			
183	Zanesville-Cambridge (Ohio)	2			
184	Central Oklahoma (Oklahoma)				3

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	Volume II[6]
185	North Central Oklahoma (Okla.)				1
186	Northeastern Oklahoma (Okla.)				4
187	Northwestern Oklahoma (Okla.)				1
188	Southeastern Oklahoma (Okla.)				3
189	Southwestern Oklahoma (Okla.)				2
193	Portland (Oregon, Washington)				3
195	Central Pennsylvania (Penna.)	4			
196	South Central Pennsylvania (Pennsylvania)	3			
197	Southwest Pennsylvania (Penna.)	12			
199	Charleston (South Carolina)	3			
200	Columbia (South Carolina)			2	
201	Florence (South Carolina)			1	
202	Greenville-Spartanburg (S.C.)			1	
203	Greenwood (South Carolina)			1	
204	Georgetown (South Carolina)			1	
207	Eastern Tennessee-Southwestern Virginia (Tennessee, Virginia)	5			
208	Middle Tennessee (Tennessee)	3			
210	Abilene-Wichita Falls (Texas)			5	
211	Amarillo-Lubbock (Texas)			9	
212	Austin-Waco (Texas)			7	
213	Brownsville-Laredo (Texas)			4	
214	Corpus Christi-Victoria (Texas)			3	
215	Metropolitan Dallas-Fort Worth (Texas)			15	
216	Metropolitan Houston-Galveston (Texas)			10	
217	Metropolitan San Antonio (Texas)			6	
218	Midland-Odessa-San Angelo (Texas)			5	

TABLE 1 (continued)

LISTING OF REFERENCES FOR MODELING ANALYSES

AQCR No.[2]	AQCR Name (States)	Report References for Each AQCR[1]			
		51 AQCR Report[3]	63 Coal-Conversion Plant Report[4]	128 AQCR Study Volume I[5]	128 AQCR Study Volume II[6]
219	Utah (Utah)				1
220	Wasatch Front (Utah)				3
222	Central Virginia (Virginia)			1	
223	Hampton Roads (Virginia)	2	1		
224	Northeastern Virginia (Va.)			1	
225	State Capital (Virginia)		2		
226	Valley of Virginia (Virginia)			2	
229	Puget Sound (Washington)				1
234	Kanawha Valley (West Virginia)			3	
235	North Central West Virginia (West Virginia)	4			
237	Lake Michigan (Wisconsin)				2
238	North Central Wisconsin (Wisc.)				1
239	Southeastern Wisconsin (Wisc.)	5		2	
240	Southern Wisconsin (Wisconsin)				1
241	Casper (Wyoming)				1
243	Wyoming (Wyoming)				1
	Total Number of Plants Analyzed	206	63	195	206
	GRAND TOTAL		670 Power Plants		

TABLE 2

POWER PLANT SUMMARY FOR 128 AQCRS

Contractor	Total Plants	Plants Which, by Themselves, Exceed the 24-Hour SO_2 Standard 1972 Operations, Nominal or Maximum Load*
Walden (Volume I)	195	20
GEOMET (Volume II)	206	54
Total	401	74

* This is not representative of all the power plants in the United States, since many large coal- and oil-fired plants were modeled previously and are not included here.

TABLE 3-a

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN CALIFORNIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
24	Burbank (E)	Los Angeles/Burbank Public Service Department	187	—	—	28,925	0.2	3,524
	Glendale (E)	Los Angeles/City of Glendale	187	—	—	18,354	0.4	2,808
	Harbor (V)	Los Angeles/L.A. Department of Water and Power	389	—	—	25,452	0.4	9,290
	Haynes (E)	Los Angeles/L.A. Department of Water and Power	1,606	—	—	292,824	0.4	51,348
	Scattergood (E)	Los Angeles/L.A. Department of Water and Power	326	—	—	33,138	0.4	10,504
	Valley (V)	Los Angeles/L.A. Department of Water and Power	546	—	—	34,818	0.5	19,612
	Glenarm (E)	Los Angeles/Pasadena Water/ Power Department	40	—	—	449	0.3	545
	Broadway (E)	Los Angeles/Pasadena Water/Power Department	171	—	—	28,260	0.3	2,729
	Alamitos (E)	Los Angeles/Southern California Edison Company	1,982	—	—	266,154	0.4	42,124

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-a (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN CALIFORNIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
24	El Segundo (E)	Los Angeles/Southern California Edison Company	1,020	—	—	289,640	0.5	14,718
	Etiwanda (V)	San Bernardino/Southern California Edison Company	911	—	—	146,664	0.4	24,973
	Huntington Beach (E)	Orange/Southern California Edison Company	870	—	—	139,356	0.4	22,770
	Mandalay (E)	Ventura/Southern California Edison Company	435	—	—	32,285	0.5	12,675
	Redondo (E)	Los Angeles/Southern California Edison Company	1,579	—	—	111,531	0.3	57,715
	San Bernardino (E)	San Bernardino/Southern California Edison Company	131	—	—	6,837	0.2	5,098
	Ormond Beach (E)	Ventura/Southern California Edison Company	806	—	—	102,396	0.4	17,987
25	Moss Landing (E)	Monterey/Pacific Gas and Electric	2,175	—	—	41,664	0.4	88,002
26	Humboldt Bay (E)	Humboldt/Pacific Gas and Electric	102	—	—	1,077	1.1	3,143

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-a (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN CALIFORNIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
29	Encina (E)	San Diego/San Diego Gas and Electric Company	331	—	—	73,248	0.2	7,221
	Silver Gate (E)	San Diego/San Diego Gas and Electric Company	247	—	—	18,148	0.4	5,738
	South Bay (E)	San Diego/San Diego Gas and Electric Company	714	—	—	116,046	0.4	23,572
	Station B (E)	San Diego/San Diego Gas and Electric Company	96	—	—	4,536	0.4	2,199
30	Avon (V)	Contra Costa/Pacific Gas and Electric Company	40	—	—	5,263	1.8	4,464
	Contra Costa (E)	Contra Costa/Pacific Gas and Electric Company	1,276	—	—	15,110	0.5	38,795
	Hunters Point (E)	San Francisco/Pacific Gas and Electric Company	372	—	—	4,935	0.4	16,696
	Martinez (V)	Contra Costa/Pacific Gas and Electric Company	40	—	—	12,626	1.8	4,340
	Oleum (V)	Contra Costa/Pacific Gas and Electric Company	80	—	—	1,428	1.8	4,697

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-a (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN CALIFORNIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
30	Pittsburg (V)	Contra Costa/Pacific Gas and Electric Company	2,029	—	—	24,190	0.5	55,541
	Potrero (V)	San Francisco/Pacific Gas and Electric Company	318	—	—	3,885	0.4	14,202
31	Kern (E)	Kern/Pacific Gas and Electric Company	100	—	—	—	—	139
32	Morro Bay (V)	San Luis Obispo/Pacific Gas and Electric Company	1,056	—	—	19,764	0.4	48,812
33	El Centro	Imperial/Imperial Irrigation District	189	—	—	6,602	1.4	5,264
	Cool Water (V)	San Bernardino/Southern California Edison Company	146	—	—	1,373	0.5	9,682

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-b

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN DELAWARE

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
46	McKee Run (E)	Kent/City of Dover	38	78	2.7	567	0.9	184
	Indian River (E)	Sussex/Delmarva Power and Light Company	340	873	1.6	1,596	0.3	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-c

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN FLORIDA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
48	Cape Kennedy	Brevard/Florida Power and Light Company	805	—	—	205,464	1.4	16,560
	Sanford New (E)	Volusia/Florida Power and Light Company	593	—	—	195,964	1.4	200
	Turner (E)	Volusia/Florida Power Corporation	202	—	—	20,244	2.2	8,337
	Indian River	Brevard/Orlando Utility Commission	259	—	—	37,504	1.7	8,638
	Lake Highland	Orange/Orlando Utility Commission	96	—	—	6,851	1.6	2,929
50	Cutler	Dade/Florida Power and Light Company	346	—	—	36,372	1.0	17,258
	Lauderdale	Broward/Florida Power and Light Company	312	—	—	68,964	1.6	10,413
	Port Everglades	Broward/Florida Power and Light Company	1,255	—	—	355,026	1.1	26,805
	Miami	Dade/Florida Power and Light Company	46	—	—	6,300	1.0	2,177

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-c (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN FLORIDA

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
50	Turkey Point	Dade/Florida Power and Light Company	804	—	—	193,872	1.3	12,152
	Riviera	Palm Beach/Florida Power and Light Company	740	—	—	174,481	1.0	14,153
	Lake Worth	Palm Beach/Lake Worth Utilities Authority	59	—	—	601	2.1	2,460
51	Fort Myers	Lee/Florida Power and Light Company	559	—	—	196,854	1.2	—
	Avon Park (E)	Highlands/Florida Power Corporation	61	—	—	12,222	2.1	1,540
52	Inglis (E)	Levy/Florida Power Corporation	54	—	—	11,718	2.2	1,963
	Bartow (E)	Pinellas/Florida Power Corporation	494	—	—	179,130	2.2	2,947
	Bayboro (E)	Pinellas/Florida Power Corporation	51	—	—	22,050	2.2	—
	Higgins (E)	Pinellas/Florida Power Corporation	138	—	—	57,078	2.2	739

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-c (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN FLORIDA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
52	Lake Parker-Plant No. 3 (E)	Polk/Lakeland Department of Electricity and Water	220	—	—	48,224	2.1	3,026
	Hookers Point	Hillsborough/Tampa Electric Company	233	—	—	91,823	2.5	—
	Big Bend (E)	Hillsborough/Tampa Electric Company	446	985	3.7	—	—	—
	Gannon	Hillsborough/Tampa Electric Company	1,270	2,421	3.7	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-d

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN ILLINOIS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
65	Keystone (E)	Peoria/Central Illinois Light Company	39	—	—	—	—	2,892

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-e

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN INDIANA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
77	Ohio River (E)	Vanderburgh/Southern Indiana Gas and Electric Company	122	—	—	10,832	0.1	3,947
	Warrick (E)	Warrick/Southern Indiana Gas and Electric Company	732	2,384	3.5	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3- f

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN MAINE

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
109	Graham (V)	Penobscot/Bangor Hydro-Electric Company	57	—	—	25,400	2.0	—
110	Wyman (E)	Cumberland/Central Maine Power Company	214	—	—	115,038	2.2	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-9

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN MARYLAND

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
115	Crane (E)	Baltimore/Baltimore Gas and Electric Company	400	—	—	177,322	0.8	—
	Could Street (E)	Anne Arundel/Baltimore Gas and Electric Company	174	—	—	60,449	0.9	—
	Riverside (E)	Baltimore/Baltimore Gas and Electric Company	334	—	—	113,127	1.0	—
	Wagner (E)	City of Baltimore/Baltimore Gas and Electric Company	980	—	—	328,915	0.8	—
	Westport (E)	City of Baltimore/Baltimore Gas and Electric Company	194	—	—	60,539	0.9	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-h

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN MASSACHUSETTS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
119	Edgar (V)	Norfolk/Boston Edison Company	261	—	—	95,865	0.9	—
	L Street (E)	Suffolk/Boston Edison Company	115	—	—	32,088	0.4	—
	Mystic (E)	Middlesex/Boston Edison Company	618	—	—	196,623	0.5	—
	New Boston (E)	Suffolk/Boston Edison Company	760	—	—	331,355	0.5	—
	Kendall Square (E)	Middlesex/Cambridge Electric Light Company	67	—	—	26,040	0.5	1,647
120	Canal (E)	Barnstable/Canal Electric Company	543	—	—	268,884	0.9	—
	Cleary (E)	Bristol/Taunton Municipal Lighting Plant	28	—	—	13,205	0.9	—
	Taunton (E)	Bristol/Taunton Municipal Lighting Plant	38	—	—	16,398	0.9	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-i

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN MICHIGAN

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
125	Morrow (E)	Kalamazoo/Consumers Power Company	186	—	—	37,459	1.0	4,461

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-j

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN MINNESOTA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
131	Southeast (E)	Hennepin/Northern States Power Company	30	—	—	1,819	0.5	285

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-k

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN NEW HAMPSHIRE

AQCR #[1]	Plant Name	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
121	Merrimack (V)	Merrimack/Public Service Company of New Hampshire	459	1,224	2.4	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-1

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN NEW JERSEY

AQCR #[1]	Plant Name	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
43	Essex (E)	Essex/Public Service Electric/Gas Company	323	—	—	84,592	0.3	544
	Hudson (E)	Hudson/Public Service Electric/Gas Company	1,115	776	1.2	139,885	0.3	12,446
	Kearny A (E)	Hudson/Public Service Electric/Gas Company	305	—	—	19,517	0.3	—
	Kearny B (E)	Hudson/Public Service Electric/Gas Company	320	—	—	115,412	0.3	—
	Linden	Union/Public Service Electric/Gas Company	613	—	—	300,659	0.6	—
	Marion (E)	Hudson/Public Service Electric/Gas Company	125	—	—	50,887	0.3	—
	Sewaren (E)	Middlesex/Public Service Electric/Gas Company	820	—	—	287,713	0.4	1,575

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-m

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN NEW YORK

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
43	59th Street	New York/Consolidated Edison Company (N.Y.)	185	—	—	60,215	0.4	—
	Hell Gate	Bronx/Consolidated Edison Company (N.Y.)	511	—	—	144,698	0.4	3,156
	East River	New York/Consolidated Edison Company (N.Y.)	605	—	—	86,663	0.3	17,719
	Hudson Avenue	Kings/Consolidated Edison Company (N.Y.)	765	—	—	146,836	0.3	1,154
	Glenwood (E)	Nassau/Long Island Lighting Company	380	—	—	126,861	0.9	1,062
	Northport (E)	Suffolk/Long Island Lighting Company	1,161	—	—	424,284	2.4	—
	Indian Point (V)	Westchester/Consolidated Edison Company (N.Y.)	275	—	—	29,723	0.3	—
158	Oswego (E)	Oswego/Niagara Mohawk Power Corporation	376	—	—	133,103	2.4	—
160	Greenidge (V)	Yates/New York State Electric/Gas Corporation	160	467	2.0	2,341	0.2	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-m (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN NEW YORK

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
160	Rochester 3 (E)	Monroe/Rochester Gas/Electric Corporation	196	—	—	79,242	1.9	—
	Rochester 7 (E)	Monroe/Rochester Gas/Electric Corporation	253	566	2.0	562	0.4	—
162	Huntley (E)	Erie/Niagara Mohawk Power Corporation	828	1,437	1.9	—	—	—
163	Goudey (V)	Broome/N.Y. State Electric/Gas Corporation	104	319	2.3	503	0.2	—
	Jennison (V)	Chenango/N.Y. State Electric/Gas Corporation	60	170	1.0	—	—	—
164	Hickling (V)	Steuben/N.Y. State Electric/Gas Corporation	70	331	1.6	—	—	—
	Milliken (V)	Tompkins/N.Y. State Electric/Gas Corporation	270	743	2.1	660	0.6	—
	Dunkirk (V)	Chatauqua/Niagara Mohawk Power Corporation	628	1,256	2.6	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-n

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN NORTH CAROLINA

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
136	Dan River (E)	Rockingham/Duke Power Company	290	869	0.9	—	—	—
165	Cliffside (E)	Rutherford/Duke Power Company	781	2,271	1.4	873	0.3	—
	Marshall (V)	Catawba/Duke Power Company	2,000	5,284	1.0	13,816	0.3	—
166	Cape Fear (E)	Chatham/Carolina Power and Light Company	391	846	1.4	388	0.1	—
	Roxboro (E)	Person/Carolina Power and Light Company	1,068	2,631	1.4	977	0.1	—
169	Weatherspoon	Robeson/Carolina Power and Light Company	166	231	1.0	—	—	2,921
170	Lee (E)	Wayne/Carolina Power and Light Company	402	874	1.1	—	—	700
171	Asheville (V)	Buncombe/Carolina Power and Light Company	414	978	1.4	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-o

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN OHIO

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
79	West End (V)	Hamilton/Cincinnati Gas and Electric Company	219	—	—	—	—	5,470
175	Shelby (E)	Richland/Shelby Municipal Light and Power Company	26	46	3.1	—	—	21
176	Columbus (E)	Franklin/City of Columbus	46	29	1.3	341	0.2	1,691
180	Norwalk Steam (E)	Huron/Ohio Edison Company	31	39	2.6	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-p

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN PENNSYLVANIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
151	Hunlock Creek (V)	Luzerne/UGI Corporation/Luzerne Electric Division	89	353	0.7	2,096	0.1	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-q

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN SOUTH CAROLINA

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
200	Wateree (E)	Richland/South Carolina Electric and Gas Company	722	1,484	1.4	3,108	0.2	—
	McMeekin (E)	Lexington/South Carolina Electric and Gas Company	250	553	1.5	—	—	3,239
201	Robinson (E)	Darlington/Carolina Power and Light Company	207	333	1.0	—	—	991
202	Lee (E)	Anderson/Duke Power Company	345	1,047	1.1	—	—	1,325
203	Greenwood (E)	Greenwood/Duke Power Company	36	—	—	8,305	0.3	1,042
204	Grainger	Horry/South Carolina Public Service	163	416	1.1	—	—	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
210	Graham (E)	Young/Texas Electric Service Company	635	—	—	491	0.7	34,201
	Morgan Creek (E)	Mitchell/Texas Electric Service Company	846	—	—	1,268	0.8	54,007
	Abilene (E)	Taylor/West Texas Utilities Company	26	—	—	361	0.5	81
	Lake Pauline (E)	Hardeman/West Texas Utilities Company	45	—	—	326	0.5	2,131
	Paint Creek (E)	Haskell/West Texas Utilities Company	242	—	—	562	0.1	8,250
211	Holly Avenue	Lubbock/Lubbock Power and Light Company	50	—	—	—	—	2,476
	Plant No. 2	Lubbock/Lubbock Power and Light Company	81	—	—	—	—	4,059
	Jones	Lubbock/Southwestern Public Service Company	248	—	—	—	—	13,825
	Nichols (E)	Potter/Southwestern Public Service Company	475	—	—	—	—	19,913

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
211	Plant X (E)	Lamb/Southwestern Public Service Company	434	—	—	2,583	0.7	21,967
	Riverview (E)	Hutchinson/Southwestern Public Service Company	35	—	—	—	—	2,859
	Denver City	Yoakum/Southwestern Public Service Company	80	—	—	—	—	6,736
	East Plant	Potter/Southwestern Public Service Company	71	—	—	349	0.7	4,304
	Moore	Moore/Southwestern Public Service Company	68	—	—	—	—	3,919
212	Big Brown (E)	Freestone/Texas Utilities Service	1,187	4,731	0.6	—	—	1,027
	Holly Street (E)	Travis/Austin Electric Department	416	—	—	3,925	1.0	13,990
	Seaholm (E)	Travis/Austin Electric Department	125	—	—	557	1.0	5,547
	Decker Creek (E)	Travis/Austin Electric Department	321	—	—	—	—	11,724

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
212	Gideon (E)	Bastrop/Lower Colorado River Authority	623	—	—	7,182	0.9	30,058
	Lake Creek (E)	McLennan/Texas Power and Light	316	—	—	1,091	0.7	19,113
	Tradinghouse (E)	McLennan/Texas Power and Light	1,380	—	—	750	0.7	61,018
213	Bates (E)	Hidalgo/Central Power and Light Company	189	—	—	55	0.7	9,976
	La Palma	Cameron/Central Power and Light Company	209	—	—	5	0.7	10,796
	Laredo (E)	Webb/Central Power and Light Company	72	—	—	4	0.7	4,444
	Victoria	Victoria/Central Power and Light Company	554	—	—	18	0.7	23,745
214	Joslin	Calhoun/Central Power and Light Company	261	—	—	2,503	0.7	13,076
	Nueces Bay	Nueces/Central Power and Light Company	566	—	—	2,516	0.7	26,355

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
214	Hill	Nueces/Central Power and Light Company	574	—	—	35	0.7	23,466
215	North Texas (E)	Parker/Brazos Electric Power Cooperative, Inc.	75	—	—	1,433	0.8	3,133
	Miller (V)	Palo Pinto/Brazos Electric Power Cooperative, Inc.	188	—	—	749	0.8	7,390
	Denton (E)	Denton/City of Denton Utilities	124	—	—	1,575	0.8	4,334
	Dallas (E)	Dallas/Dallas Power and Light Company	154	—	—	2,003	0.7	5,332
	Mountain Creek (E)	Dallas/Dallas Power and Light Company	990	—	—	5,550	0.9	34,632
	North Lake (E)	Dallas/Dallas Power and Light Company	709	—	—	5,449	0.8	29,075
	Parkdale (E)	Dallas/Dallas Power and Light Company	341	—	—	2,306	0.7	7,602
	Lake Hubbard (E)	Dallas/Dallas Power and Light Company	397	—	—	2,394	0.3	15,193

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
215	Newman (E)	Dallas/Garland Municipal Power and Light Company	97	—	—	1,547	0.3	2,238
	Olinger (E)	Dallas/Garland Municipal Power and Light Company	189	—	—	396	0.8	7,135
	Handley (E)	Tarrant/Texas Electric Service Company	523	—	—	294	0.7	19,084
	North Main (E)	Tarrant/Texas Electric Service Company	81	—	—	470	0.9	4,059
	Eagle Mountain (E)	Tarrant/Texas Electric Service Company	706	—	—	1,168	0.6	23,158
	Collin (E)	Collin/Texas Power and Light Company	156	—	—	1,304	0.7	7,110
	Valley (E)	Fannin/Texas Power and Light Company	1,175	—	—	3,861	0.7	33,400
216	Lewis Creek (E)	Montgomery/Gulf States Utilities Company	543	—	—	21	0.2	28,676
	Clarke	Harris/Houston Lighting and Power Company	210	—	—	68	1.8	2,289

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
216	Deepwater	Harris/Houston Lighting and Power Company	335	—	—	78	1.9	15,807
	Greens Bayou	Harris/Houston Lighting and Power Company	375	—	—	58	1.9	6,138
	Robinson	Galveston/Houston Lighting and Power Company	1,550	—	—	—	—	90,375
	Bertron	Harris/Houston Lighting and Power Company	826	—	—	664	1.7	46,247
	Wharton	Harris/Houston Lighting and Power Company	323	—	—	195	2.1	16,454
	Parish	Fort Bend/Houston Lighting and Power Company	1,255	—	—	193	1.6	66,370
	Webster	Harris/Houston Lighting and Power Company	614	—	—	80	1.8	26,813
	Cedar Bayou	Chambers/Houston Lighting and Power Company	1,530	—	—	—	—	93,334
217	Braunig (E)	Bexar/San Antonio Public Service Board	894	—	—	3,841	0.3	30,306

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
217	Mission Road (E)	Bexar/San Antonio Public Service Board	114	—	—	77	0.5	3,462
	Tuttle (E)	Bexar/San Antonio Public Service Board	494	—	—	703	0.7	13,479
	Leon Creek (E)	Bexar/San Antonio Public Service Board	189	—	—	—	—	3,764
	Sommers (E)	Bexar/San Antonio Public Service Board	446	—	—	10,078	0.2	11,421
	Comal (V)	Comal/Lower Colorado River Authority	60	—	—	2,166	2.0	4,017
218	Permian Basin	Ward/Texas Electric Service Company	165	—	—	—	—	10,302
	San Angelo (E)	Tom Green/West Texas Utilities Company	101	—	—	214	0.1	4,348
	Oak Creek (E)	Coke/West Texas Utilities Company	82	—	—	197	0.4	4,153
	Concho (E)	Tom Green/West Texas Utilities Company	53	—	—	446	0.5	248

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-r (continued)

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN TEXAS

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
218	Rio Pecos (E)	Crockett/West Texas Utilities Company	137	—	—	—	—	10,772

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-s

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN VERMONT

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
159	Moran (V)	Chittendon/Burlington Electric Light Department	30	33	1.0	—	—	592

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-t

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN VIRGINIA

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
222	Brantly (E)	Pittsylvania/City of Danville	29	36	0.9	41	0.3	1,671
224	Bremo Bluff (E)	Fluvanna/Virginia Electric Power Company	254	536	1.0	—	—	—
226	Riverton (E)	Warren/Potomac Edison Company	35	45	1.2	—	—	—
	Glen Lyn (V)	Niles/Appalachian Power Company	403	846	1.0	2,831	0.3	—

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-u

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN WEST VIRGINIA

AQCR #[1]	Plant Name[2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
234	Kanawha River (V)	Kanawha/Appalachian Power Company	439	1,230	0.9	97	—*	—
	Amos (E)	Kanawha/Appalachian Power Company	1,633	4,144	1.1	5,145	—*	—
	Cabin Creek (V)	Kanawha/Appalachian Power Company	221	355	1.3	—	—	41

* Sulfur content (distillate oil) was not estimated because the emissions were negligible compared to those of the coal burned.

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

TABLE 3-v

SUMMARY OF 1972 POWER PLANT FUEL USE FOR PLANTS

IN WISCONSIN

AQCR # [1]	Plant Name [2]	County/Power Company	MW	1972 Annual Fuel Use				
				Coal		Fuel Oil		Natural Gas
				10^3 Tons	% S	10^3 Gals	% S	10^6 Ft^3
239	Commerce (E)	Milwaukee/Wisconsin Electric Power Company	35	—	—	2,258	0.3	1,840
	Lakeside (E)	Milwaukee/Wisconsin Electric Power Company	310	—	—	15,995	0.5	8,221

1. Other plants in each AQCR may have been modeled previously; refer to Table 1. In addition, plants in interstate AQCRs are listed under the state in which they are located, so that plants in the same AQCR may appear on different tables.

2. "V" indicates valley model. "E" indicates terrain model. No notation indicates flat model.

REFERENCES

1. Steam-Electric Plant Factors/1972/1973/1974 Editions, National Coal Association, Washington, D.C. (1973)(1974)(1975).

2. Turner, D.B., "Workbook of Atmospheric Dispersion Estimates," U.S. Department of Health, Education, and Welfare, PHS Publication No. 992-AP-26 (Rev. 1970).

3. Briggs, G.A., "Some Recent Analyses of Plume Rise Observations," In: Proceedings of the Second International Clean Air Congress. Academic Press, New York, N.Y., pp. 1029-1032 (1971).

4. Briggs, G.A., "Discussions - Chimney Plumes in Neutral and Stable Surroundings," Atmospheric Environment, Vol. 6, pp. 507-510 (1972).

5. "Summary Report on Modeling Analysis of Power Plants for Compliance Extensions in 51 Air Quality Control Regions," Walden Research (Contract No. 68-02-0049), December 17, 1973, EPA Report Number EPA-450/3-75-060; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

6. "Summary Report on Modeling Analysis of Power Plants for Fuel Conversion," Walden Research (Contract No. 68-02-1377), May 1975, EPA Report Number EPA 450/3-75-064; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

7. "Summary Report on Modeling Analysis of Selected Power Plants in 128 AQCRs for Evaluation of Impact on Ambient SO_2 Concentrations, Volume II," GEOMET, Inc. (Contract No. 68-02-1483), June 1975, EPA Report Number EPA-450/3-75-063; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

8. "Modeling Analysis of Power Plants for Evaluation of Impact on Ambient SO_2 Concentrations, (Name) AQCR (No.)," Walden Research (Contract No. 68-02-1484). Sixty separate reports, dated between Fall 1974 and Spring 1975, are available from the Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711. The APTIC number associated with each AQCR report is shown below:

AQCR #	AQCR Name	APTIC #
24	Metropolitan Los Angeles	75453
25	North Central Coast	75454
26	Northeast Plateau	75455

AQCR #	AQCR Name	APTIC #
29	San Diego	75456
30	San Francisco Bay Area	75457
31	San Joaquin Valley	75458
32	South Central Coast	75459
33	Southeast Desert	75460
43	New York - New Jersey - Connecticut	75461
46	Southern Delaware	75462
48	Central Florida	75463
50	Southeast Florida	75464
51	Southwest Florida	75465
52	West Central Florida	75466
65	Burlington - Keokuk	75467
77	Evansville - Owensboro - Henderson	75468
79	Metropolitan Cincinnati	75469
109	Down East	75470
110	Metropolitan Portland	75471
115	Metropolitan Baltimore	75472
119	Metropolitan Boston	75473
120	Metropolitan Providence	75474
121	Merrimack Valley - Southern New Hampshire	75475
125	South Central Michigan	75476
131	Minneapolis - Saint Paul	75477
136	Northern Piedmont	75478
151	Northeast Pennsylvania - Upper Delaware Valley	75479
158	Central New York	75480
159	Champlain Valley	75481
160	Genessee - Finger Lakes	75482
162	Niagara Frontier	75483
163	Southern Tier East	75484
164	Southern Tier West	75485
165	Eastern Mountain	75486
166	Eastern Piedmont	75487
169	Sandhills	75488
170	Southern Coastal Plain	75489
171	Western Mountain	75490
175	Mansfield - Marion	75491
176	Metropolitan Columbus	75492
180	Sandusky	75493
200	Columbia	75494
201	Florence	75495
202	Greenville - Spartanburg	75496
203	Greenwood	75497
204	Georgetown	75498
210	Abilene - Wichita Falls	75499

AQCR #	AQCR Name	APTIC #
211	Amarillo - Lubbock	75500
212	Austin - Waco	75501
213	Brownsville - Laredo	75502
214	Corpus Christi - Victoria	75503
215	Metropolitan Dallas - Fort Worth	75504
216	Metropolitan Houston - Galveston	75505
217	Metropolitan San Antonio	75506
218	Midland - Odessa - San Angelo	75507
222	Central Virginia	75508
224	Northeastern Virginia	75509
226	Valley of Virginia	75510
234	Kanawha Valley	75511
239	Southeastern Wisconsin	75512

APPENDIX A

A BRIEF DESCRIPTION OF PREVIOUS POWER PLANT MODELING STUDIES

The work summarized in Volumes I and II of this report is a continuation of power plant modeling efforts underway since late in 1972. For convenience, this appendix briefly describes earlier efforts performed either by the Source Receptor Analysis Branch, MDAD, OAQPS, EPA, or by Walden Research. With completion of the effort reported herein, all fossil-fueled power plants reporting to FPC in 1972 have now been modeled. A listing of AQCRs modeled in each effort is given in Table 1 of this report.

The various modeling studies have been performed for slightly different purposes and on somewhat different data bases. Therefore, the following paragraphs give a brief summary of the basis for the previous studies. The most important point to be borne in mind is that these studies should not be taken in isolation as providing a definitive "answer" for a specific plant. All available data on the plant's operation and surroundings should be evaluated in reaching any final conclusions. These supplementary data should include: the impact of other sources in the area, measured air quality data, known or suspected downdraft or fumigation problems, unique nearby terrain features, nearby land use patterns and population distributions, more specific operational data for the plant, impact of units new since the base year of the study, specific meteorological studies for the area, and additional studies and findings by other investigations. Only a full consideration of all these data will lead to a balanced and reasonable decision.

Plants Modeled by SRAB

SRAB has modeled power plants in a total of eight AQCRs. The first three (Indianapolis, Southern Indiana, and Wabasn Valley) [A-1] were modeled to define an acceptable strategy for dealing with the projected deficit of low-sulfur coal arising from full application of SIPs as

originally promulgated. That study, which considered all sources of SO_2, concluded that: (1) power plant variances (or plan revisions) offered the best strategy for reducing the low-sulfur coal deficit while maintaining at least primary SO_2 air quality standards; and (2) in considering power plants for variances (or plan revisions), it is absolutely essential to consider the 24-hour standard, since in most cases, this is the limiting value. Subsequently, SRAB modeled power plants in an additional five midwest AQCRs [A-2] to define the amount of low-sulfur coal demand reduction which might be obtained by variances to coal-fired power plants. Both of the SRAB studies used FPC data for the power plants and included best available projections to 1975.

Plants Modeled by Walden Research (BOA 69-02-0049, Tasks 8 and 11)

These modeling studies covered 180 power plants in 43 coal-intensive AQCRs. The purpose of the studies was to determine the amount of low-sulfur coal demand reduction which might be obtained from variances (or plan revisions) for coal-fired power plants. Basic information on power plant operations was taken from FPC Form 67 for 1971; projections to 1975 were made, based upon best available information from the FPC and other sources. Variance status was determined by a comparison of predicted air quality with a criterion value of 290 $\mu g/m^3$. SO_2 concentrations at or below this value were considered acceptable to achieve primary standards (allowing up to 75 $\mu g/m^3$ for the concurrent contributions of all other sources). Air quality impact of SIP conditions was also calculated. Results of the studies were presented in individual AQCR summary reports.

Walden issued a report [A-3] which summarized the results of their modeling studies under Tasks 8 and 11 as well as the previous modeling conducted by SRAB. This report summarizes results from modeling 206 power plants in 51 AQCRs. The report showed that low-sulfur (less than 1%) coal demand could be reduced by about 137 million tons/year by selective application of variances, while still achieving primary SO_2 air quality standards.

Plants Modeled by Walden Research (BOA 68-02-1377, Task 2)

As a result of the oil shortage during the winter of 1973-1974 and subsequent legislation, a number of plants have been and are being considered for converting certain units from oil- to coal-firing. The purpose of this modeling study was to define the air quality impact of possible fuel switches. Both SO_2 and particulate concentrations were evaluated. Modeling was conducted for two situations: (1) 1972 operations and (2) with certain units switched to coal. A comparison of the two situations shows the change in maximum concentrations associated with switching fuels. Time and data constraints made it impossible to project operations beyond 1972. Isopleth maps of concentration superimposed on population density maps were also prepared. Results of the study are presented in four "Group" reports (Group I-IV) and a report on AQCR #42. It is important to note that only those plants proposed for fuel conversion and those other plants which might have significant interaction were modeled, not all plants in the AQCR, as in the previous studies. Sixty-three plants located in 17 AQCRs were modeled in this study. Walden published a report [A-4] summarizing this study in May 1975.

REFERENCES - Appendix A

A-1. "Fuel Distribution Study for the Indianapolis, Southern Indiana, and Wabash Valley AQCRs," EPA Draft Report, March 1973. Also see addendum to the draft report, dated April 12, 1973. APTIC Report #75403 available from Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

A-2. "Fuel Distribution Study for Five Midwest AQCRs," EPA Draft Report, revised May 1973. APTIC Report #75404,available from Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

A-3. "Summary Report on Modeling Analysis of Power Plants for Compliance Extensions in 51 Air Quality Control Regions," Walden Research Division of Abcor, Inc. (Contract 68-02-0049), December 17, 1973; EPA Report #EPA-450/3-75-060, available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

A-4. "Summary Report on Modeling Analysis of Power Plants for Fuel Conversion," Walden Research Division of Abcor, Inc. (Contract 68-02-1377), May 1975; EPA Report #EPA-450/3-75-064, available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

APPENDIX B

DESCRIPTION OF THE MODELS

Description of the Single Source Model (CRS MOD)

The model used to estimate ambient concentrations for plants located where terrain was judged not to have a significant effect is one developed by the Meteorology Laboratory, EPA. This model is designed to estimate concentrations due to sources at a single location for averaging times of 1 hour, 24 hours, and 1 year, with emphasis on the 24-hour value.

This model is a Gaussian plume model using diffusion coefficients based on Turner (1970).* Concentrations are estimated for each hour of the year, based on the wind direction (in increments of 10 degrees), wind speed, mixing height, and Pasquill stability class. For the 1- and 24-hour values, it is assumed that the pollutant does not "decay" significantly between the source and the receptors because of the short travel time involved. Also, decay depends on a number of meteorological variables and might well be insignificant when the meteorological conditions occur which lead to highest SO_2 concentrations.

Meteorological data for 1964 were used. The reasons for this choice are: (1) data from earlier years did not have sufficient resolution in the wind direction; and (2) data from subsequent years are readily available on magnetic tape only for every third hour.

Mixing height data were obtained from the twice-a-day upper air observations made at the most representative upper air station. Hourly mixing heights were estimated by the model using an objective interpolation scheme.

Description of the Single Source Terrain Adjustment Model (CRSTER)

To simulate the effect of elevated terrain in the vicinity of plants where terrain was judged to have a significant effect, the modeling analysis used a terrain adjustment procedure which considered the difference

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* Turner, D.B., "Workbook of Atmospheric Dispersion Estimates," U.S. Dept. of H.E.W., PHS Publication No. 999-AP-25 (Rev. 1970).

between the plant elevation and the elevation at each receptor. Ground elevations on 10° radials as well as points of maximum elevation were determined from U.S.G.S. quadrangle maps. The diffusion model then used the difference between the plant elevation and the receptor elevation to modify the effective stack height and thereby adjust the predicted concentrations.

Description of the Valley Model

The model used to estimate short-term concentrations for plants located in severe terrain is one developed previously by EPA for application to sources located in complex terrain (valley model). Elevations of the receptor sites are derived from contours on the U.S.G.S. quadrangle maps of the area. The model calculates a daily average concentration at these receptor locations based on a 10 meter nearest-approach point of the plume and an assumed persistence of meteorological conditions for 6 hours out of the 24 hours. During this period, the wind direction azimuth is considered to be confined to a 22.5 degree sector. This model assumes a stability class "E" (stable) and a wind speed of 2.5 m/sec.

More detailed descriptions of the three models are given in the AQCR reports written by GEOMET, Inc.

APPENDIX C

FORMS OF TABLES USED IN INDIVIDUAL AQCR REPORTS

Table 3,

Maximum Ground Level Concentrations of SO_2[a]

Plant	Maximum 24-Hr. Concentration X_{24}, $\mu g/m^3$		Maximum Annual Concentration X Annual, $\mu g/m^3$
	Nominal Load	Maximum Load[b]	

a. Estimated maximum concentrations based upon 1972 operations.

b. Based on operation at 95% of rated capacity and the addition of a 10% safety factor to the computed concentration.

Table 4.

SO_2 Emissions and Basis Maximum Concentration Day

Plant	Principal Fuels	% Sulfur	Nominal Load Case		Maximum Load Case	
			Amount Fuel[a]	SO_2 Emissions Tons/Day	Amount Fuel[a]	SO_2 Emissions Tons/Day

a. coal, 10^3 tons/day; oil, 10^3 gals/day; gas, 10^6 CF/day.

Table 5.

$\frac{X}{Q}$ Relationships for Plants

Plant	Maximum Concentration Day $\frac{X}{Q}$ • $\frac{\mu g/m^3}{gm/sec}$		Maximum Annual Concentration $\frac{X}{Q}$ • $\frac{\mu g/m^3}{gm/sec}$
	Nominal Load	Maximum Load	

APPENDIX B

Source Input Data

AQCR #

Plant (Company)	Stack No.	Rated Capacity (10^6 Btu/hr)	Stack Height (m)	Stack Diam. (m)	Normal Load Operations: Stack Exit Velocity (m/sec)	Normal Load Operations: Stack Exit Temp. (°K)	Normal Load Operations: SO_2 Emissions[a] (gm/sec)	Normal Load Operations: Plant Variation Factors[c]	Maximum Load Operations: Stack Exit Velocity (m/sec)	Maximum Load Operations: Stack Exit Temp. (°K)	Maximum Load Operations: SO_2 Emissions[b] (gm/sec)

a. Based on annual average operations.

b. Based on plant operating at 95% of capacity.

c. The underlined value corresponds to the month of the maximum concentration day. The factors are listed chronologically, starting with January.